

Subtopics:

1. Definition of Life
2. History of early life forms
3. Evolution: Formation of new species from pre-existing species.
4. Biological Species
5. Taxonomic rules and nomenclature
6. Later evolution of life-- the past 500 million years or so.
7. How many species are there?
8. Key points about species and evolution
9. Links to physical systems.

Some definitions:

Life: the process of being an organizing entity.

Evolution: the formation of new species from pre-existing species.

Taxon (plural Taxa): a grouping of organisms with a similarity in either characteristics or evolution or both.

Species: A group of individuals capable of interbreeding.

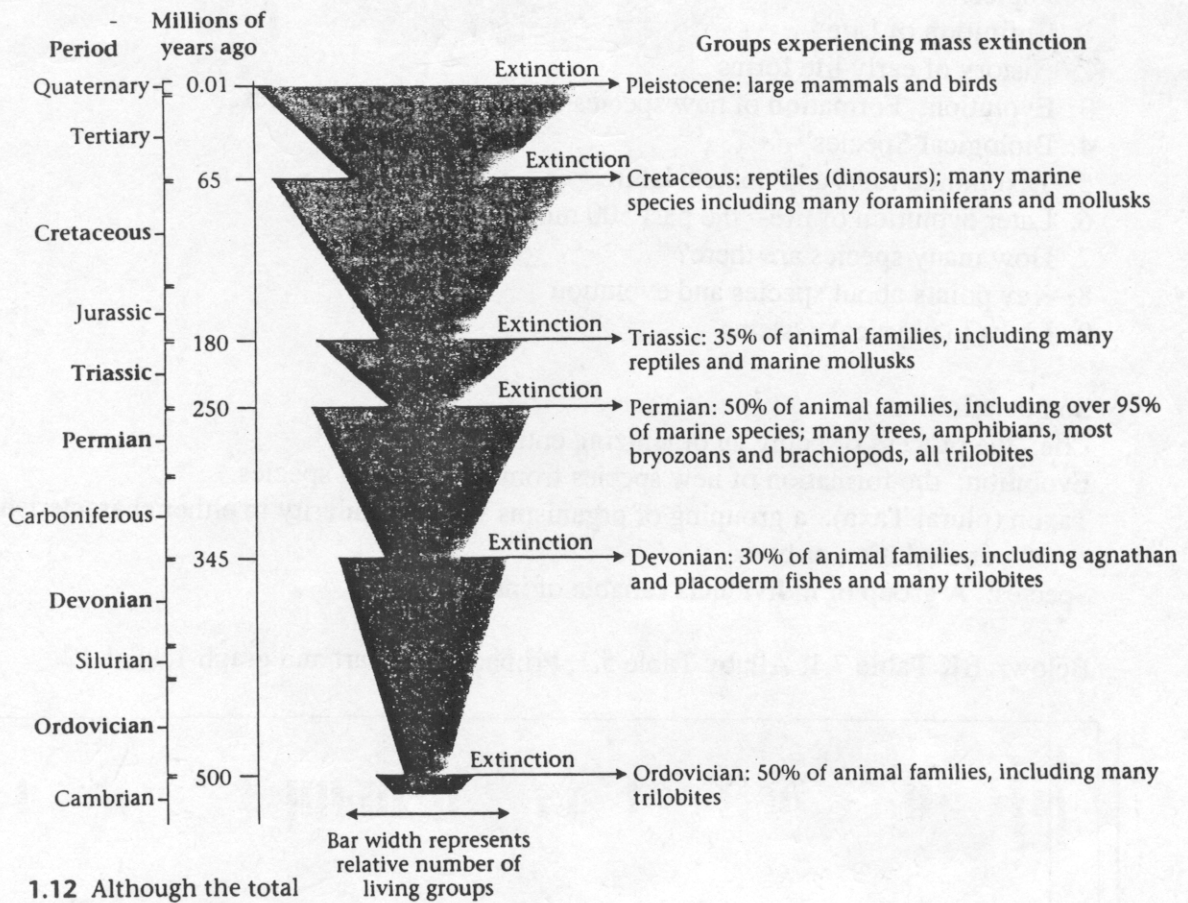
Below: BK Table 7.1, Allaby Table 5.1, Primack pie chart and graph 1.11, 1.12.

TABLE 7.1 Comparison of Species Estimates

Kingdom/Phylum Subphylum/Class	Mader, 1997	Campbell, 1996	Raven, 1999	Margulis, 1988	E.O. Wilson, 1988
Virus				100000	4760 (+Archea)
Monera			100		
Archaeobacteria			7500		
Cyanobacteria			7000		
Fungi		100000	790	100000	575
Chytridiomycota	600	600	1060	600	665
Zygomycota	30000	6000	31000	tens of thousands	28650
Ascomycota	30000	25000	22300	25000	16000
Basidiomycota	25000			25000	
Deuteromycota		60000		thousands	
Protista			8000		500
Ciliophora	8000		700		
Myxomycota	560		200		
Alveolates			2000-4000		
Oomycota	580		694		580
Euglenophyta	1000		900	800	800
Dinoflagellata	1000	800		several thousand	1100
Sarcodina	40000	1100			
Sporozoa	3600				
Chrysophyta	11000	850	1000		12500
Bacillariophyta		10000	100000		
Phaeophyta	1500	1500	1500	10000	1500
Rhodophyta	4000	4000	4000-6000	4000	4000
Chlorophyta	7000	7000	17000	7000	7000
Plantae				24000	16600
Bryophyta	12000	10000	9500		
Hepatophyta	10000	6500	6000		
Anthocerotophyta	1000	100	100		
Psilophyta	several	10-15	several		9
Spirophyta	1000	1000	1000	1000	1275
Pteridophyta	15	15	15	40	15
Gymnosperms				12000	10000
Angiosperms	12000	12000	11000	550	
Pterocarphyta	550	550	550	550	
Coniferophyta	100	100	140	100	
Cycadophyta	100	100	100	100	
Gnetophyta	70	70	70	70	
Anthophyta		235000	235000	230000	
Monocotyledones	65000				50000
Dicotyledones	170000				170000
Animalia					
Porifera	5000	>1,000,000		10000	5000
Cnidaria	9000	9000		9000	9000
Platyhelminthes	13000	20000		15000	12200
Rotifera	2000	1800		2000	
Nematoda	12000	80000		80000	12000
Mollusca	110000	50000		110000	50000
Annelida	12000	15000		5400	12000
Arthropoda	>6 million	nearly 1,000,000		500000	989761
Cheliceriformes					
Uniramia					
Insecta					
Anoplura	2460	2460			
Coleoptera	500000	500000			
Dermaptera	1000	1000			
Hymenoptera	8000	8000			
Lepidoptera	55000	55000			
Hemiptera	90000	90000			
Isopoda	2000	2000			
Lepidoptera	140000	140000			
Odonata	5000	5000			
Orthoptera	30000	30000			
Siphonaptera	1200	1200			
Trichoptera	7000	7000			
Crustacea	330	330			
Brachiopoda	6550	6550		335	6100
Echinodermata	45000	45000		6000	
Chordata	850	850		45000	
Vertebrata					
Amphibia	850	750			843
Reptalia	20000	30000			18150
Aves	3900	4000			4184
Mammalia	6000	7000			6300
	9000	8600			9040
	4500	4500			4000

Note: With ~15,000 new species described every year, a changing classification system, and no central data registry, it is not surprising that species estimates differ between publications and years.

Sources: E. O. Wilson, 1988; L. Margulis and K. V. Schwartz, 1988; Sylvia L. Mader, 1997; Neil A. Campbell, 1996; P. H. Raven, R. F. Evert, and S. E. Eichhorn, 1999.



1.12 Although the total number of families and species has increased over the eons, during each of five episodes of natural mass extinction a large percentage of these groups disappeared. The most dramatic period of loss occurred about 250 million years ago, at the end of the Permian period. We are now at the start of a sixth episode, the Pleistocene extinction, as human populations eliminate species through habitat loss and overharvesting.

Table 5.1 Number of species described and the likely total number

Group	No. described (thousands)	Estimate of total no. (thousands)
Viruses	5	500
Bacteria	5	400
Fungi	7	1000
Protozoa	40	200
Algae	40	200
Nematodes	15	500
Molluscs	70	150
Crustaceans	40	100
Arachnids	75	600
Insects	950	4000
Vertebrates	45	50
Higher plants	250	300
Total	1605	8000

1.11 Approximately 1,413,000 species have been identified and described by scientists; the majority of these are insects and plants. Large numbers of insects, bacteria, and fungi are still undescribed, and the eventual number of identified species could reach 5 million or more. (Data from Wilson 1992.)

